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20 October 1982

# WEST EUROPE REPORT SCIENCE AND TECHNOLOGY

No. 123

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## BIOTECHNOLOGY

### YOUNG GENETIC ENGINEERING FIRM ENJOYS EARLY SUCCESS

Paris LE MATIN in French 16 Aug 82 p 16

[Article by Marie-Ange d'Adler, special correspondent in Strasbourg:  
"Genetic Engineering: The Great Transgene Adventure"]

[Text] With two triumphs in 16 months of existence, this small company born of a meeting of French bankers and researchers is in a good position in this new scientific and industrial race. About 10 days ago, a small private company, Transgene, announced a scientific breakthrough: Its researchers had succeeded in getting bacteria to produce a viral particle of the rabies virus (see LE MATIN 3 August). This may constitute the first step toward manufacture of a new vaccine. It is the second triumph for this very young company, which was founded 2 years ago as a result of a meeting between the number two man at the Banque de Paris et des Pays-Bas [Bank of Paris and the Netherlands; Paribas], Robert Lattes, and two French specialists in molecular biology, Pierre Chambon and Philippe Kourilsky. The result was a completely original small enterprise, the only firm backed by private European capital that is dedicated entirely to genetic engineering and that already seems to be in a good position to take on the world competition in this field. This is a novelty for France, where up to now the academics have ignored the industrialists and have had little to do with the world of finance.

A plaque on the sixth floor of a faculty of medicine building reads "Transgene." Here, among the university laboratories, a small private firm has taken up residence. A small firm unlike any other: Transgene is the only private enterprise in Europe that is dedicated entirely to genetic engineering.\* This is a small firm that succeeds: After 16 months of work, it already has two achievements to its credit.

\*Genetic engineering is the set of techniques (some of which have won Nobel prizes for their discoverers) that can be used to alter the genetic makeup of an organism and thus its function. Genetic engineering has obvious practical implications, since it can be used to get microorganisms to produce substances useful to man.

The first was with interferon, a natural substance from which it was hoped to obtain a weapon against viruses and perhaps against certain cancers. The second, announced at the beginning of the month, may open the way to a new rabies vaccine. In the scientific and industrial race to use genetic engineering, Transgene seems to be in a good position for the future.

This whole story began about 3 years ago, when Paribas decided to put money into advanced technologies and came to understand the role that "venture capital" (that is, long-term investment) could play in that area. In the United States and Japan there is already a boom in biotechnologies, based on putting living cells to work for mankind. Hardly anything is being done in France. "Yet our country holds some trumps, some researchers who are among the best in the world in molecular biology, and especially in genetic engineering. When we were abroad, we kept hearing certain names mentioned more often than others..." recalls Robert Lattes, research and development director at Paribas. Lattes contacted two French researchers; Philippe Kourilsky, at the Pasteur Institute of Paris, and Pierre Chambon, at the University of Strasbourg. Thus Transgene was born by bringing together a number of unsuspecting parties: five large investors (Paribas, Assurances Generales de France, BSN-Gervais-Danone, ELF [French Gas and Lubricants]-Aquitaine and Moet-Hennessy) and two renowned researchers. Chambon and Kourilsky became Transgene's scientific advisers, but they retained positions in public research organizations where they directed teams working on the frontiers of science.

A difficult problem remained to be solved: In a nation where academics and industrialists traditionally avoid one another, how might Transgene's position at the crossroads of research, industry and finance be defined? The founders arrived at an imaginative solution whereby a 23-percent share of the new company's assets was turned over as a free donation to certain public research organizations: 12 percent went to a group, G 3, that had an economic interest, the Pasteur Institute, CNRS [National Center for Scientific Research], INSERM [National Institute of Health and Medical Research] and INRA [French Institute for Agronomical Research]; 3 percent went to the Louis Pasteur University of Strasbourg; and 8 percent went to a research foundation set up by Kourilsky and Chambon.

This was a means of providing basic research with a guarantee that it would benefit from industrial applications of its discoveries. This was also a means of attracting high-quality researchers. "This structure appealed to my imagination," admits Jean-Pierre Lecocq. A man of 35 with a slight Belgian accent, he is Transgene's scientific director. A specialist in molecular biology, he gave up a position directing the genetic engineering laboratory of a large American firm to come organize the Transgene team in September 1980.

"Applications have poured in from all countries: after only a few weeks we began receiving resumes from more than 200 high-level researchers.... We were able to get started very quickly, and that was important in a field where the competition is lively and where the techniques are evolving very fast," says

Lecocq. Presently, 45 persons work at Transgene, of whom 20 are researchers of eight different nationalities (United States, Great Britain, Ireland, Netherlands, Belgium, Australia, India and France) and 18 are Alsatian technicians.

White laboratory benches and petri dishes, gel columns and centrifuges--the Transgene laboratories look about the same as other labs. Molecular biology does not offer any spectacle. "We work with empty test tubes," jokes Lecocq. "A picogram of product, you can hardly see it."\* But he is proud of his team. "We have assembled a tool for work in all fields where genetic engineering is applicable: in pharmaceuticals, of course, but also in the agro-food and chemical industries." With those goals in mind, at Transgene they are working with the entire battery of the various microorganisms and cells capable of being used in genetic engineering. They have also set up a laboratory for chemical synthesis of DNA (the molecule that carries the information controlling the biological function of an organism). This fast-growing technique, which can be used to make artificial custom-designed genes, is in fact opening the way to second-generation genetic engineering.

Sixteen months after startup of the laboratory, Lecocq can feel satisfied. Two successes in so short a time is not a bad start. Although on interferon Transgene arrived a few weeks behind Genentech, the American leader in genetic engineering, Transgene got even by beating Genentech at the wire on rabies.

These two successes have established a pattern. "We have proven that Transgene can provide a link between basic research and industry," emphasizes Lecocq. Indeed, on interferon, the Transgene team did the early work in cooperation with the researchers at the Curie Institute, then concluded a research and development contract with one of the biggest companies in the French pharmaceutical industry, Roussel-UCLAF. On rabies, there was similar collaboration with persons engaged in basic research at the Wistar Institute of Philadelphia, followed by a development contract with the Merieux Institute, a leader in the field of vaccines.

Are there other contracts in the works? On that subject, Transgene is not talking. Even the board of directors does not always know the name of the client and the purpose of the contract: Transgene should be able to work with everyone, including its investors' competitors! But they will nevertheless "admit" that there is another "important" contract with a French firm and that negotiations are in progress with foreign companies.

In short, if Transgene's researchers are pleased, the investors are too. They have furnished a hefty Fr 81 million to keep the laboratory running for 5 years. Already, thanks to the contracts, it has been possible to increase the operating outlays about 25 to 30 percent in constant francs compares with original projections. Therefore, they confidently await the second stage of the financing: the one in which they begin to collect the royalties.

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\*1 picogram =  $10^{-11}$  gram.

## BIOTECHNOLOGY

### PREUSSAG TO EMPLOY BACTERIAL LEACHING OF ORES

Bonn RHEINISCHER MERKUR in German 20 Aug 82 p 13

[Article by Harald Steinert: "Reviving Tired Mines"]

[Text] Microorganisms are to increase the yield of a mine on the northern edge of the Harz Mountains. Preussag wants to get an additional several tens of thousands of tons of zinc and copper from Rammelsberg--using microbes.

West Germany's mining technology is now employing a new mining method: For the first time, "bacterial leaching" is to be used in the procurement of non-ferrous metal. With the help of this method, the idea is to mine those residual ores which can no longer be obtained with standard mining technology at the world-famous "Rammelsberg" near Goslar. Preussag--the owner of the deposit--has already pushed the development work very far and, in the context of the raw material research program of the Federal Ministry of Research and Technology, hopes to get between 1 and 2 million tons of ore there with the help of microorganisms. "Getting" in this case means "extracting the metal content from the rocks" because the micro-miners separate the metals out of the rock without any need to move the dead rock.

Methods of "bacterial leaching" of ores are widespread today. In general one of course uses existing bacteria, such as "Thiobacillus ferrooxydans," which live in the clefts and cracks of ore-containing rocks and multiply there. By virtue of their metabolism, they generate very high degrees of acidity in the seepage water of the deposit and dissolve most of the ores consisting of sulfides (sulfur compounds) in that they oxidize the sulfur into sulfuric acid. Paradoxically, the method is called "bacterial leaching" in German although it does not work with lye but rather with acid.

Microbe activity is partly being used in already mined ore piles or in metal-rich waste dumps but it is partly also used in the "solid, existing" ore, in other words, in the rock itself--in this case, the method is called "in situ leaching," in other words, "leaching on the spot." Using this bacterial method, about 0.2 million ton of copper is already being obtained per year in the United States at this time (about 12 percent of the country's copper output). This method is also being used in the Soviet Union, in Australia, and in France (where it is employed for uranium extraction). In the



FRG, the Federal Institute of Earth Sciences and Raw Material in Hanover has for quite some time now been experimenting with this type of metal extraction. This effort is aimed especially at the extraction of copper from the big, underground copper slate fields, for example, in Hesse, where there are metal deposits going into the millions of tons. The ore strata however are partly so deep or are so poor in metal that conventional mining, with shafts and galleries is not worthwhile. The idea is to drill into those strata, infecting them with microbes specifically bred for copper slate, and to get the microbes to separate the metal out; the metal then only needs to be pumped to the surface and that is a very attractive idea. Of course, the practical implementation of such undertakings is still rather remote.

Professor Wilhelm Schwarz at the Braunschweig Technical University (Microbiology Institute) is pursuing a somewhat different project. He is trying to use bacteria for the separation of ores, bacteria which do not live on sulfur oxidation (like the sulfur-oxidizing bacteria in the nonferrous metal deposits) but which need other energy sources, for example, organic carbon compounds. Such "heterotrophic" bacteria must be fed constantly if they are at work in the ore deposit. They work there by generating other, weaker acids (such as citric acid and oxalic acid) and with these acids they dissolve other metals than the oxidizing bacteria.

The researcher is thinking of using these microorganisms to get very high-grade metals, such as uranium, or the mining of "silicadic" (silicic-acid-containing) nickel ores. This kind of microbial leaching of course becomes much more expensive because one must keep supplying the bacteria with food. Even if one uses the cheapest waste products, such as sulfite waste lye, one must make sure that the objective of this extraction effort will be worth the expenditure. The method is still being developed at this time.

The first use of microbes in German mining was not the result of the desire to gain primarily metals but rather sprang from environmental concerns. Rammelsberg, the oldest metal ore mine in Central Europe (apart from the copper mining operation on Helgoland during the Bronze Age), in operation for more than a thousand years, is almost exhausted today. A part of the deposit, the so-called "old deposit," where mining operations have been going on since the Middle Ages, has been abandoned already since the middle of last century. And mining operations are still going on in the "new deposit" but it will contain not a single ton of ore at the latest within 7 years. But the mine waste waters continue to flow.

These mine waste waters--in other words, the seepage water which penetrates the rock from the surface and which goes through the cracks and clefts, the shafts and galleries throughout the entire mountain--is still acid and metal-containing. The sulfide-devouring bacteria, which oxidize the ore, which forms sulfuric acid, and which dissolve metals, discovered this interesting source of food called "Rammelsberg ore" already many centuries or even thousands of years ago and they have settled down wherever the water, which carries oxygen, can penetrate.

These bacteria in other words have been at work already since primeval times. Because of that, the mine waters, which flow out of the mountain, perhaps at

the rate of 150 liters per minute, today contain several grams of zinc and up to 200 milligrams of copper per liter--not enough to extract these metals but too much to allow the acid waste waters to flow unhindered into the water network after the abandonment of mining operations in Rammelsberg. This is why there has been a search for efficient possibilities for quite some time in order in the future to be able to collect these mine waters and to purify them. Preussag researchers got the idea of enriching the already metal-containing outflow with metal to such an extent that metal extraction would be worth the trouble.

For this purpose, the acid waters are to be caught and then again to be allowed to seep into the mountain, specifically, where as yet unmined ore remnants are suspected. This primarily involves the "old deposit" which was mined without any accurate mine surveying and mine charts. Here we still have the ore pillars between the dead rock which contain valuable metals; here we still have collapsed ore portions and here the old miners allowed ore to remain because it looked unprofitable to them since it perhaps contained too little copper and silver and too much zinc.

This "old deposit," which has been heavily mined in earlier centuries, represents ideal settlement terrain for the ore-extracting microbes. If metal-containing solutions are piped into the promising portions of this deposit, the microbes would have to supply additional metal quantities--assuming that one can give them an incentive "to work" and assuming that they will become more intensively active than normal. This incentive would have to come from the supply of oxygen. Just exactly how this is to be done is as yet not clear (by means of compressed air, oxygen, or through the water) and this is also a problem which must first be solved during the research and development project which "Preussag" has launched.

For a time, researchers also experimented with various bacteria strains in the hope of finding particularly hard-working mining types with which one could infect the ore. Such breeding experiments however were abandoned because it turned out that the bacteria, living by nature in Rammelsberg, are very well adjusted to their environment and are doing their best already in separating ores and in working on metal extraction. And so the microbes already living in Rammelsberg will be hired for service with Preussag.

The hoped-for metal volumes by no means are small: The ore on the average contains about 11 percent zinc, 5 percent lead, and 1 percent copper, so that the 1-2 million tons of ore, which the company hopes to extract with the help of microbes, could yield several hundreds of thousands of tons of zinc and several tens of thousands of tons of copper. The entire extraction effort at Rammelsberg today amounts to only about 270,000 tons per year. The "in situ leaching" process presumably will extend over a whole series of years, perhaps even decades.

In addition to the advantage of useful water management in its mine, which is to be closed down in a few years anyway, Preussag hopes that the project will yield extensive know-how in a technology which would seem to assume rising significance in international mining and which could also be used in other ore deposits owned by Preussag.

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CSO: 3102/444

## ELECTRONICS

COMPANY FOUNDED IN SCOTLAND TO PRODUCE IC'S CHEAPER, FASTER

Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German  
30 Aug 82 p 7

[Article: "Integrated Circuits Faster and Cheaper"]

[Text] Lattice Logic, Edinburgh--The steps from design to production of integrated circuits can be organized for greater speed and economy in the opinion of this newly founded Scottish company. Lattice Logic will offer products and services to this end. The company's first product is a production aid for a CMOS group-gate circuit which, according to company sources, is the first silicon compiler for group-gate circuits. A highly developed structural concept offers the basis for more efficient development of complex electronic circuits. Lattice Logic was founded by Dr John Gray who was leader of the Silicon Structures Project at the California Institute of Technology from 1978 to 1980. The company will be jointly financed by Technical Development Capital and Eastern Scottish INDUSTRIAL Investments. It is expected that the first CMOS group-gate circuit will be produced at General Instrument's integrated-circuit factory located at Glenrothes New Town.

The new company calls its most important service "silicon brokerage." This service makes it possible for users to share the costs of a complete production cycle of a standardized IC process even though their individual circuit designs differ. In this manner, the cost and time for developing prototypes, for example, can be significantly reduced. This is the first service of its type in Europe. In September the company will conduct its first formal course in VLSI circuits. In this course, engineers will be given the opportunity to design their own LSI components using Mead and Conway's structure-specific design methodology for NMOS components.

Lattice Logic expects this year's sales to come to \$400,000. Dr Gray is convinced that sales will exceed \$10 million within 5 years. Even though small-lot production of special circuits presently amounts to only 1 to 2 percent of total production volume, Lattice management expects such special designs to reach 10 percent of production inside of 2 years.

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CSO: 3102/442

## ELECTRONICS

### BRIEFS

IMPROVED CMOS TECHNOLOGY--The "stacked transistor CMOS" technology, by means of which P-channel transistors are fabricated on polycrystal silicon and located on N-channel transistor grids, was recently improved by a "selective" laser annealing technique. The latter consists of cutting, with conventional photomasking, a silicon nitride anti-reflection coating on top of zones in which the polycrystal silicon is to be remelted during the laser annealing. Inverters have also been made at CNET-CNS (National Center for Telecommunications Studies), whose P-channel transistors have channels shorter than 4 microns. Hole mobility reaches  $120 \text{ cm}^2 \text{V}^{-1} \text{s}^{-1}$ , which is one-third the mobility in single crystal silicon. The leakage current of these transistors is of the order of 10 pA per micron of junction, a value that guarantees this technology one of the major advantages of CMOS, low electric consumption. The inverters fabricated operate at supply voltages between 2 V and 20 V. [Text] [Issy-les-Moulineaux L'ECHO DES RECHERCHES in French Jul 82 p 60] 11,023

FRENCH FLAT-PANEL DISPLAYS--As part of a study of flat-panel integrated screens, conducted at CNET-Lannion B (National Center for Telecommunications Studies), the TIC department is currently developing an MOS technology with amorphous and polycrystal silicon on large size glass substrates, as well as studies on electrochrome materials as passive electro-optic transducers for several colors. The first stage will result in the achievement, in 1982, of a high-definition (16 points per square-mm) flat screen with 320 lines and 320 columns on an area of nearly a square-dm. Each dot on the screen will consist of an amorphous silicon transistor which will excite a twisting nematic liquid crystal. The objective of the second phase of the project will be to integrate the vertical and horizontal shift registers with a polycrystal silicon MOS obtained by the dynamic annealing of amorphous silicon. The last phase will consist of combining polycrystal silicon transistors with the electrochromic materials studied in the laboratories of the department, so as to fabricate a flat video screen with several colors. [Text] [Issy-les-Moulineaux L'ECHO DES RECHERCHES in French Jul 82 p 60] 11,023

USE OF MICROELECTRONICS ENCOURAGED--TN. Frankfurt, Sept 1. The Government is providing an annual subsidy of DM 450 million for a special program to support microelectronics applications in small and medium-sized companies. The first statistics relating to the requests made by industry to date for

Government support are now available. According to Government information provided at the request of Member of Parliament Boernsen, the bulk of the proposals relate to instrumentation and control technology and its application to the energy conservation problem. About 50 percent of the proposals came from this area; about 25 percent from the narrower field of information processing and about 5 percent each from the areas of automobile, household and medical equipment. The Government believes that it has achieved its goal of supporting mostly small and medium-sized companies in the innovative application of microelectronics. According to an initial analysis, more than two thirds of the proposals were submitted by small and medium-sized companies. About 20 percent of the companies are less than 10 years old. Fewer than 10 percent of the proposals came from companies with annual sales of more than DM 500 million. According to information available to date from the companies, at least 20 percent of the proposing companies plan to hire additional development personnel for the projects. [Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 2 Sep 82 p 7] 9160

CSO: 3102/442

## ENERGY

### TEST OPERATION OF GROWIAN TO BEGIN IN EARLY 1983

Frankfurt/Main ELEKTRIZITAETSWIRTSCHAFT in German 7 Jun 82 pp 363, 383-84

[Interview with Director Dipl Eng Manfred Brohmeyer, chairman of the Board of Schleswig AG, Rendsburg, by the editor of ELEKTRIZITAETSWIRTSCHAFT: "Growian on the Test Stand--Large Wind Energy Plant Expected To Take Up Test Operation in Early 1983"; on 16 June 1982 on the occasion of the membership meeting of the Association of German Utilites--VDEW e.V.]

[Text] [Question] A few weeks ago, assembly work was started on the site of the Large Wind-Energy Plant ("Growian," for short) in Kaiser-Wilhelm-Koog, Brunsbuettel. This implies that that plant is nearing completion. Can you give some details as to the progress of construction?

[Answer] If everything continues to go according to schedule, the most difficult and at the same time the most interesting stage of project construction will start in September. The 375-ton equipment room has to be hoisted into its final operating position some 100 m in the air. Completion, including the final functional test, of the individual systems is scheduled for late fall of 1982 so that the 6-week trial run can probably start in early 1983.

[Question] The purpose of the project has been the subject of extensive public discussion. What are the tasks and aims of the Growian research project?

[Answer] The Growian Construction Operation research and development project for the purpose of power generation is part of the energy research program of the Federal Ministry for Research and Technology, which bears the full costs of the erection and a major portion of the cost of research operation of the project. Our company is responsible for the erection, the operation and the testing of the Growian wind-energy plant as a prototype.

The purpose of the project is to determine the actual cost of the construction and operation and the power output potential of the given wind-energy supply. Standards for the evaluation of the technical feasibility and the performance, particularly in system operation, can only be found in real practice. This also applies to the economic feasibility of power generation by large wind-energy plants.

Another aspect to be examined is the wind at this height and its characteristics. The two rotor blades, which total 100 m, are assembled almost 100 m up in the air. Throughout the world no such data exists.

[Question] What finding is the test operations expected to come up with?

[Answer] The test operation, which will probably comprise a period of 3 years, is to yield findings by means of which the technical problem of large wind plants and their energy efficiency can be better understood. Comprehensive tests are geared toward detecting the wind parameter in various altitudes, the plant output, loads, performance of the power system, and management.

Experts will also be interested in the connection of the 3-MW generator to the existing medium-voltage system and the performance during operation.

The standard operation should present no problems.

But how will the wind-energy plant react in the event of failure? Tests have already shown that the wind-energy plant has to be resynchronized with the system every time there are "short failures" in the medium-voltage system.

[Question] The three utility companies Hamburgische Electricitaetswerke AG, Schleswig AG and Rheinisch-Westfaelisches Elektrizitaetswerk AG are taking part in the construction and operation of Growian. You just said that the costs of the project are borne by the Federal Ministry of Research and Technology. Why did these utility companies participate in the project?

[Answer] To answer this question, I have to go back a little. In 1977, the Ministry of Research gave a research grant to industry to produce plans for a 3-MW wind-energy plant ready for construction. The hub of the plant was to be 100 m in the air in order to collect data on such a plant at this height.

Upon completion of the study, the ministry was looking for a company that would be and was capable of being responsible for the construction and operational management of such a plant.

That is how in early 1980 the above-mentioned three utilities together founded a company called Grosse Windenergieanlage Bau und Betriebsgesellschaft mbH, to implement the construction and the research operation thereafter.

[Question] In the past discussions there have been vast differences with respect to the quoted costs of the Growian project. The latest figures are around DM 90 million. What does this sum comprise?

[Answer] The sum of DM 90 million contains all costs incurred in connection with the Growian project. DM 8 million are for preliminary studies and tests alone. The construction costs for Growian and the three wind-measuring poles alone are DM 68 million. This sum includes the cost increases and charges incurred during the planning and construction phase. The steel beams of the wings, for instance, had to be extended into the wing tips for rigidity, causing additional costs. Another DM 14 million approximately have been budgeted for the operation, management and implementation of a wind-measuring program.

It must be kept in mind that Growian is a prototype. Indeed, it is our objective to determine the actual costs and test the possibility of series production.

If produced on the assembly line, Growian would certainly turn out to be considerably less expensive. It is understood that the costs of development and manufacture of a prototype are above average.

[Question] What are the expectations with respect to this installation according to the latest findings?

[Answer] The Large Wind-Energy Plant is designed such that it starts up at wind velocities of 6.3 m/s and over (approximate wind velocity 4). At 12 m/s (wind velocity 6) the installation reaches its nominal output, and at 24 m/s (wind velocity 10 to 11) it must be shut down. The generator at an altitude of 100 m is to have a 3,000-kW output in favorable wind. Over the year this corresponds to 12 million kWh of electricity. The assumption was that during some 27 percent of the year the nominal output would be reached, and less than the nominal output during another 50 percent of the year, i.e., during one-fourth of the time the plant would be idle due to either too little or too much wind.

Technically, however, this annual output is sufficient to cover the annual requirement of 250 single-family homes, including heating. Also, 4000 households could be supplied with power, or 3.5 million liters of heating oil of an oil-fueled power plant be saved. However, as the wind does not blow all the time, power plants have to guarantee the power supply on those days without wind, as specified by the Energy Act.

Incidentally, Growian will operate without any environmental impact. Only the rotation of the rotor blades produces a noise, and that is comparable to that of a glider.

[Question] Newspapers frequently report on foreign wind-energy plants. In the FRG, however, the utilization of wind energy is not discussed in public very much. Can we therefore conclude that other countries are undertaking greater efforts to utilize wind energy to generate power?

[Answer] No! The FRG has a long tradition in this respect, particularly northern Germany. The Hamburgische Electricitaetswerke and the Schleswig AG did research in the field of application of wind-driven generators in cooperation with manufacturers as early as in the period from 1949 to 1954.

First experience was gained by a test plant in Buesum equipped with a 9-kW generator. This experiment was utilized in the construction of a 100-kW plant which went into operation in Stoetten, Swabian Alb, in 1960.

The GKSS Research Center Geesthacht has been gathering experience with several smaller plants in Pellworm, a North Sea island. The plants are 9 and 12 m high and generate a maximum output of 10 kW each.

In recent years, however, several large plants were erected abroad. The two plants in Denmark near Nibe on the Lumfjord, for example, have a 630-kW output each and are approximately 45 m high.



Several large plants generating 1.5 to 2 MW from wind are located in the United States.

With its 3-MW output and a hub height of 100 m, Growian exceeds all existing wind-energy plants. As we have no experience on this scale so far, we have to undergo expensive research and tests.

The final word regarding the success of the plant will not be spoken until 3 years of research and operation have been completed. Then more data will be available to predict the future of economical utilization of wind energy.

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CSO: 3102/429

## INDUSTRIAL TECHNOLOGY

### KRUPP INTRODUCES ENERGY-EFFICIENT, LOW TEMPERATURE FURNACE

Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German  
26 Aug 82 p 7

[Text] Krupp Handel GmbH [Incorporated], Essen. According to company sources, Krupp has developed new, low-temperature heating boilers based on a forward-looking design. They are being offered under the designation "opti-cal" GOR and GOR-TS in seven structural sizes. The new gas-oil special heating boiler supposedly operates in the low-temperature range in a sliding manner without a lower temperature limit and is thus very energy-saving. In the combustion chamber, we have the cylindrical noble-steel combustion chamber which has been tested for the past 4 years and which reveals radially arranged rib-like section steel pieces (see photo). They become hot immediately during burner operation so that the combustion chamber reportedly always remains dry. No condensate is supposed to form even at low boiler-water temperatures and this means that there is no corrosion either. Krupp has given the combustion-engineering efficiency at about 92 percent. Because of the sliding operating mode, radiation losses (less than 1 percent due to good installation) and operating readiness losses are so small that--according to Krupp--we get an extremely high annual efficiency with more than 85 percent.

The built-in electronic and fully-automatic regulating component--it detects, regulates, and saves--makes sure that the boiler will be operated at the temperature that corresponds to the heating system and the purpose of the operation. It regulates and thus minimizes heat generation for heating purposes and hot-water preparation. The boiler temperature is regulated in a sliding manner by means of the weather sensor. The weather-dependent regulator has two outputs. One of them controls the burner and the other one controls the thermal drive. For subsequent or follow-up regulation, it is possible to connect a mixing valve with thermal valve.

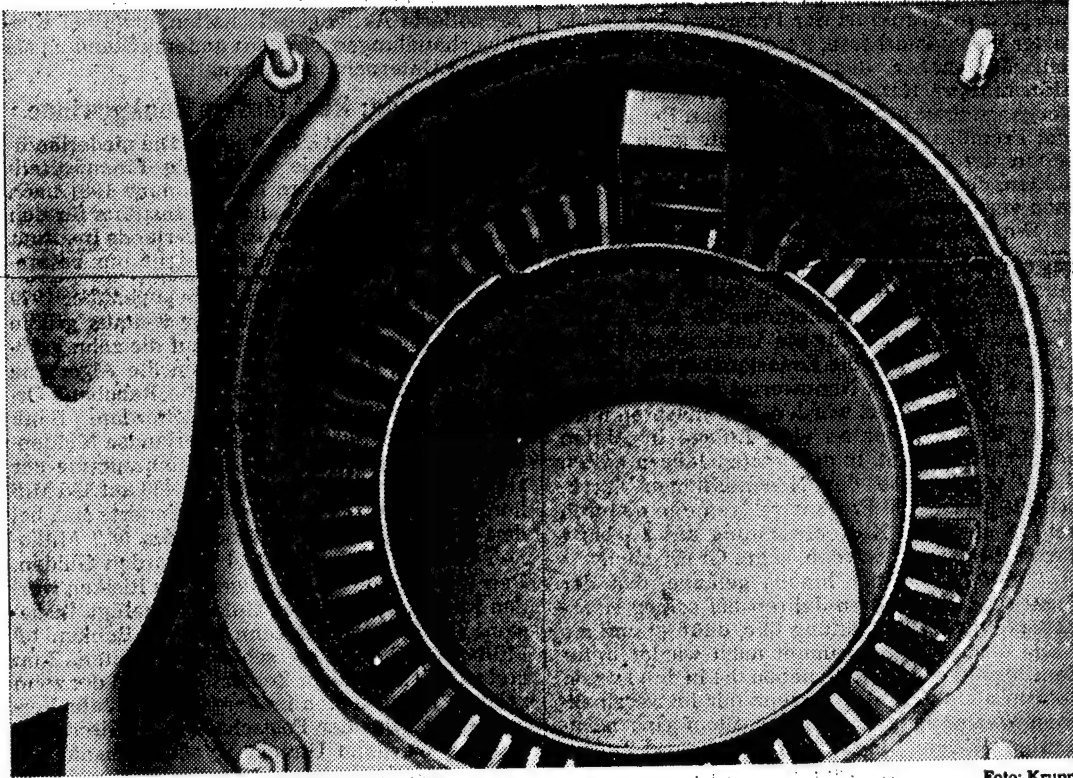


Foto: Krupp

5058  
CSO: 3102/443

## INDUSTRIAL TECHNOLOGY

### 'PRODUCTICS' PLAN AIMS AT NATIONAL-SCALE AUTOMATION

Paris ELECTRONIQUE ACTUALITES in French 3 Sep 82 pp 1,4

[Article by G. Bidal: "With the 'Productics Plan,' National-Scale Automation Is at Stake"]

[Text] To develop research, to improve transfers of technology with the industry, to create in enterprises the technical and human conditions that will lead to the acceptance and progress of automation: such are the ambitions of the future "productics" plan announced this summer by Mr Chevenement, minister of Research and Industry.

Few concrete decisions have yet been made for this program which aims at a 25 percent annual rate of growth in the process-control industry; no financial commitments have been made either, although investments are likely to exceed 2 billion francs over 3 years. In announcing this program, which is primarily intended to ensure consistency among the various sectors (electronic systems, machine-tools plan, textile, etc), the minister primarily intended to point out the decisive importance of process-control for the whole industry.

#### Just Another Plan?

Is the "productics program" outlined in July by Mr Chevenement just another "plan"? Probably not: in making this neologism official, the new minister of Research and Industry intended primarily to elevate to the rank of national priority the task of automating the French industry as a whole.

If he used "productics" rather than "robotics"--a word that the public mind probably still associates too much with job layoffs--it is also because the problem goes well beyond the limits of a given industrial sector or technology: rather, what is involved is the massively accelerated introduction of new technologies based on electronics in the whole French industrial fabric, and especially in the manufacturing sector.

#### To Act on Demand

As such, this plan--which must still be referred to in the future tense--will first concentrate on demand, its objective being to bring to 7 percent the

average production increase in manufacturing industries, which would mean doubling productivity within 10 years. At this rate, supply, and the process-control equipment industry as a whole, would sustain a rate of growth exceeding 25 percent per year. For the rest, the guidelines contain no surprise: developing research and procedures of transfer to the industry, with the creation of regional centers; making "technological audit" possibilities available to manufacturing industries in all regions; maintaining permanent contacts with all the personnel involved, essentially through unions; in brief, developing first and foremost a climate favorable to a modernization of industrial plants and equipment.

Obviously, these provisions are very broad; for more detail, we shall have to wait even though it is more than likely that the conclusions of the report of Mr Petiteau's Robotics Mission will be used as a framework. But the very intention of this new and ambitious plan obviously requires additional consideration; designed to link the "electronic systems action program" and other operations such as the machine-tools plan, it will have to reflect to a large extent the eight sectorial reports requested last April by the former minister of Industry and dealing with automation in the textile, clothing, shoe, wood-processing, furniture-making, plastics and ceramics industries. The productics plan will also have to rely on the conclusion of Mr Persuy's (Saunier-Duval) report on mechanical engineering: besides, the principal conclusions of this report have much to do with electronics since, according to Mr Persuy, the principal weakness of mechanical engineers, and one that must be corrected, is their lack of training in data-processing and electronics. A synthesis of these various reports is being prepared by Mr Turret of the Economic Information and Forecasting Bureau. The difficulty in ensuring the consistency of a plan that involves many sectors probably explains why it is still incomplete, especially with respect to financial questions. All the more so as, to a large extent, the "productics" budget will be divided up among many other operations, electronic systems, machine-tools plan, etc.

#### Two Billion Francs Over Three Years

Nevertheless, this budget is expected to exceed 2 billion francs over 3 years, i.e. close to the amount recommended in the conclusions of the "Petiteau" report."

Besides, the first decisions actually made come within the scope of electronics as they involve the creation of a national computer-assisted design and manufacture project, and the development of regional process-control research and development centers. A "software and engineering" section should also serve as a link between operations in the electronics sector and the operations contemplated in various other sectors.

9294

CSO: 3102/456

## INDUSTRIAL TECHNOLOGY

### NEW SWEDISH STEEL PROCESS TO BE USED COMMERCIALY IN CANADA

Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German  
1 Sep 82 p 5

[Text] tar, Frankfurt, 31 August--The Inred method for pig iron production, developed in Sweden by Boliden AB, is to be used for the first time on a commercial basis by a steel mill belonging to the Canadian Ivaco, Inc., in the Province of Ontario, according to a report in the magazine INDUSTRIAL RESEARCH AND DEVELOPMENT. The contract, recently signed by both companies, represents extraordinary progress in pig iron production. Work on the project has already begun and is to be completed at the end of 1984 with the start of the first Inred steel mill. At a cost of about \$100 million--of which \$60 million alone are earmarked for the installation of the Inred system--Ivaco, one of North America's most successful steel producers, wants to expand and modernize its Ontario plant. Ivaco President Paul Invanier pointed to the many advantages of this method: Low degree of environmental pollution, low energy consumption, and the fact that only one reactor is needed. The Inred method is one of three modern pig iron production methods developed in Sweden in recent years. The other two are the plasma melt process of SKF Steel and the Eldred process of Asea/Stora Kopparberg. All three of them do not require any blast furnaces and reportedly show lower operating costs than the conventional pig iron production methods because sinter plants and coking plants can be eliminated. According to calculations and experiments, pig iron production based on the Inred method costs 30 percent less than the traditional way of using the blast furnace.

5058

CSO: 3102/443

## INDUSTRIAL TECHNOLOGY

### RECOVERY OF HEAVY METALS FROM STEEL PLANT EXHAUST-GAS FILTERS

Stockholm NY TEKNIK in Swedish 10 Jun 82 pp 18-19

[Article by Sture Skold: "From Dangerous Waste to Valuable Metal. Profitable for SKF to Protect the Environment"]

[Text] Landskrona. The plasma technique is the solution to a serious environmental problem--the heavy metals from the exhaust gas filters in iron and steel mills. Worthless waste can also be converted to hard metals with this technique.

"This is a very profitable business," says Karl-David Sundberg, chief of SKF Steel. "It is so profitable that for the first time we are going into the recovery business. We have never done that before."

Together with Landskrona Finance, SKF has formed a new company, ScanDust AB, to start a recovery installation on Varvsudden in Landskrona. Each of the two companies are investing 20 million in capital and Landskrona Finance is also allowed to include an additional 3 million for the premises which are made available in the old Oresundsvarvet. An apparently good business since LF only paid 1 krona for the entire shipyard. The seller was the government-owned Svenska Varv.

#### Serious Problem

The Environmental Protection Agency also considers the project to be so important from an environmental point of view that they have gone in with a capital contribution of an additional 25 million kronor.

This money is a pure contribution and does not return a single krona regardless of how well the factory runs in the future.

"The ScanDust project solves one of the most serious problems in the steel industry," says Valfrid Paulson at the Environmental Protection Agency. The metal dust from the exhaust gas filters is now being placed in waste dumps, where the heavy metals can be leached out into the ground water. With the process installation in Landskrona it will instead become new metals.

According to the plans, the installation will produce 35,000 tons of metals annually when it starts operating in 1985. First of all, it will be metals

such as zinc and raw iron, but also chromium, nickel and molybdenum.

The raw material consists of 75,000 tons of metal dust from steel plants in Sweden and the rest of Scandinavia, but even dust from steel plants in central Europe may be of interest.

#### Commercial Breakthrough

"The establishment in Landskrona involves a commercial breakthrough for the plasma technology," says Karl-David Sundberg, "This is metallurgical processes from the 1980's and the 1990's, and we now expect to sell several installations in Europe."

Plasma dust is only one of several different processes involved in the plasma technique. The common denominator for these processes is the plasma generator. In this generator electrical energy is converted to heat energy, and this takes place through an ionized gas, a plasma.

"When the installation is ready, we will be able to run demonstrations of several of the other plasma processes."

#### Twenty-four Hours Every Day, All Year

The installation will be running 24 hours per day and for the whole year. Those who work there will be working in five shifts. In full operation the installation will employ approximately 70 men, 55 of which are collective employees who are taken from the laid-off shipyard personnel. In addition it is estimated that some 30 additional people from Landskrona will be employed in associated activities, guards, clean-up people, repairmen, etc.

In spite of the fact that the installation is considered to be economical with energy, large quantities of energy are required to extract pure metals from the metal dust from the exhaust gas filters. The installation will use approximately 90 GWh/h annually. This corresponds to 9,000 cubic meters of oil or one-half of the energy requirements in Landskrona today.

#### Develop Remote Heat

On the other hand the installation returns 45 GWh in the form of hot water. This will come in handy since the municipality is now developing the central remote heat network. The fact that the municipality recently decided to build a new hot water center for 10 million kronor means nothing, according to municipal counsel Bo Nilsson.

"We need all the energy we can get. There is room for the heat supply from ScanDust, too," says he.

The installation also gives approximately 30,000 tons in pure waste and slag products, and this will come in handy in the plans for building a proper deep port in Landskrona. It is believed that the waste can be used as an excellent fill material. A proper port is also a condition for being able to ship in all the metal-containing dust required for the process.



When the waste dust arrives at the process installation, it must be sorted according to whether it is low alloyed material (contains few alloys) or whether it is rich in alloys. Then the dust is mixed with coal, sand and water to form a slurry.

In the plasma generator itself, the processed gas consisting of 70 percent carbon monoxide and 30 percent hydrogen is ionized. This means that the electrons are separated from the gas atoms at a very high temperature, 3000--5000°C.

The iron is collected at the bottom of the shaft furnace, and if the powder from the silo contains zinc, it is converted into gas, which disappears up the shaft, where it is captured by a zinc condenser and precipitates in the form of molten zinc.

"Of course, here in Landskrona it fits in extremely well," says Erik Cavalli-Bjorkman. "Large quantities of fill material are required for the planned deep port."



The heart of the process is a shaft furnace, in which the metal oxides are broken down into metals and carbon monoxide.

Key to the Figure:

1. Coal, sand
2. Grinder
3. Big sack container
4. Dust
5. Slurry mixer
6. Filter
7. Dryer
8. Crusher
9. Silo
10. Slag former
11. Transmitter
12. Plasma generators 3x6 MW
13. Shaft furnace
14. Slag
15. Process gas
16. Raw iron
17. Zinc
18. Compressor
19. Surplus gas
20. Cleaning, cooling
21. Bypass
22. Zinc condenser
23. Coke
24. Drying

8958

CSO: 3102/420

## TRANSPORTATION

### HISTORY OF AIRBUS, BOEING COMPETITION ANALYZED

Paris SCIENCES ET AVENIR in French Sep 82 pp 22-26

[Article by Jacques Morisset: "The Airbus-Boeing War. When Twin-Jets Challenge Long-Haul Aircraft"]

[Text] The competition between the Boeing 767 and the Airbus A 310 on the medium-haul aircraft market is becoming fiercer all the time and, as a result, both aircraft have just shattered performance records for this category: the A 310 by connecting Kuwait to Singapore nonstop, the B 767 by doing the same for Oslo and Seattle. But economic and geopolitical considerations rather than technical characteristics will decide the issue of this ruthless war.

What is the true definition of a medium-haul aircraft? Until last 4 July, the answer was clear: an aircraft which can carry its passengers over distances ranging from 1,500 to 4,000-5,000 km: below that was the range of the short-haul aircraft; beyond, the realm of the long-haul aircraft dominated by the 150-380 ton 3-jet or 4-jet aircraft which can cross the oceans with all the safety margins required; the failure of one engine (even of two on certain aircraft) must not jeopardize in any way its precious cargo (150-500 passengers). On arrival, the aircraft must still contain enough fuel for diversion to another airport 200 nautical miles (370 km) from its destination point and for a 30-minute low-altitude holding flight in case of crowding of the terminal zone, poor visibility, etc. Therefore, everything has been designed so the long-haul aircraft never runs short of fuel, which would of course have tragic consequences. And, of course, twin-jets are forbidden to fly over the oceans, unless they remain at all times less than 90 minutes away from an airport: time enough to make a safe landing after a prolonged descent should an engine fail and the aircraft lose 50 percent of its thrust.

Let us point out that, whereas crossing the North Atlantic Ocean between Europe and the United States or Canada represents a 6,000-6,500 km flight (i.e. 7-8 hours in flight), most modern long-haul aircraft can do much better than that; this is why there are direct flights between Paris, London or Frankfurt and Los Angeles (10,000 km); there are even a few 11,000-km-long transpacific flights for which 3-jet DC 10's or 4-jet B 747 are used, which thus fly close to 13 hours without refueling and well deserve their name of "very long-haul aircraft."

On these flights, the crew is doubled and the most fortunate passengers, those in first class, are given fold-back seats which enable them to take some rest between their three meals and the inevitable movie.

Within a few days, all this was now thrown back into question by the remarkable performances of two ambitious newcomers among transport aircraft: the Airbus A 310 on the one hand, the Boeing 767 on the other hand, which have literally shattered the sacrosanct limitations of medium-haul jet aircraft; the A 310 in the night of 3-4 July by linking Kuwait to Singapore, which represents a flight distance of slightly over 4,000 nautical miles (7,410 km); the Boeing 767 in the night of 6-7 July by linking Boston to Turin, thus covering about 3,780 nautical miles (7,000 km), followed by a direct Oslo-Seattle flight, i.e. 8,030 km, on 21 July!

The history of these extraordinary flights deserves recounting in detail as the circumstances under which they took place also illustrate the fierce struggle which now opposes Boeing to Airbus Industrie: the old and the new, in a way.

Before that, we must take a look back; in July 1978, Airbus Industrie and Boeing announced almost simultaneously the start of two large projects very closely related, and therefore in direct competition: the Airbus A 310 on the one hand, the B 767 on the other hand. The A 310 was introduced as an aircraft complementing the A 300 (already in service for 4 years) and with a smaller capacity: 200 seats instead of 250. The fuselage diameter was the same as on the A 300 so as to maintain a certain relationship with the latter, and the new aircraft was therefore shorter. The wings, however, were entirely redesigned so as to take full advantage of the latest progress in aerodynamics (especially through the use of so-called "supercritical" airfoils which, for equal velocities, make it possible to have thicker, i.e. more rigid and, therefore, lighter wings, as well as a large useful volume to house fuel tanks); they were also smaller (210 square meters instead of 300), therefore lighter and well adapted to the mass of the new aircraft which was to weigh 15 tons less than the A 300. Finally, all the avionics (electronic systems) were redesigned and relied in particular on digital data transmission, instead of the analog systems used until then. Indeed, digitalization makes it possible to decrease weight and increase precision and safety. Practically, Airbus Industrie had thus designed an 80 percent new aircraft, more modern and more economical to use and, for its part, the A 300 benefited from the progress realized on the A 310, and a new 270-seat version, the future A 300-600 (to fly next year) was introduced. At any rate, the intention had been to create a medium-haul aircraft that could be used for 500-5,000 km flights.

The problem was slightly different at Boeing which created an entirely new aircraft that was to place itself halfway between the 3-jet B 727 (150 seats) and the huge B 747 (350-500 seats). However, Boeing also has in mind a three-jet long-haul, and therefore heavier, version of the B 767: the future B 777. As a result, a 283-square-meter wing area was selected, as it would eventually be most suitable for the B 777, although it had the disadvantage of uselessly weighing down the B 767 with a wing that was slightly too large for it. For the rest (engines, transport capacity, range, takeoff and landing performances), the B 767 appeared as a true replica of the A 310.

Years went by; while orders were piling up, mainly for the A 310 in Europe and the Middle East, and for the B 767 in North America, although at a lesser rate than had been expected (due to the stagnation of world air transport and the resulting financial difficulties for most airlines), the two manufacturers made a point of adhering strictly to the development schedules published in July 1978. On 26 September 1981, the first B 767 made its initial flight in Seattle; it was followed by 5 more aircraft, which already totalled 1,900 flight hours at the end of July, when the FAA gave the new aircraft its certificate of airworthiness. In August, deliveries to United Airlines started and the aircraft will be placed into service on 8 September. Boeing is scheduled to deliver 26 B 767's before the end of year, the initial production rate being 4.5 aircraft per month. Let us point out in passing that this rate is also that of the Airbus A 300 which has been on the line for 8 years now. This is a measure of Boeing's quickness in delivering a new aircraft: the line starts immediately at a high rate in order to meet consumer requirements as soon as possible and saturate the market to the greatest possible extent: later on, the production rate can always be adjusted to the demand and manufacturing personnel laid off at short notice, a *sine qua non* of efficiency from the American point of view...

As for Airbus Industrie, the first A 310 flew on 3 April, and testing started on the second on 13 May and on the third in August. Certification is scheduled for late March 1982 [as published], and the first deliveries to Swissair and Lufthansa immediately afterward. Therefore, there is an 8 months' lag between the two programs, which can be accounted for by the very nature of Airbus Industrie: a consortium of six manufacturers from six countries (Germany, Belgium, Spain, France, Great-Britain and the Netherlands). Managing such a group will of course result in a few problems, with respect to both coordination and decision-making, not to mention, as a backdrop, the control that must be exerted by the governments who have provided their financial guarantee. That is the other side of the coin; on the other hand, government support provides the group with a stability envied by Boeing which must rely exclusively on the market and the banks...

As for the rise in production rate, it is expected to be much slower than that of the B 767 with, however, an essential correction: in Toulouse, the A 310 is progressively taking its place on the well-organized assembly line of the A 300. Properly speaking, therefore, no new assembly line is being started but an existing line is being modified, the A 300 being progressively phased out and replaced by the A 310 and the A 300-600. And Airbus project managers intend to keep to a very progressive production rate rise: 4 aircraft per month earlier this year, 4.5 now, 5-6 in 1983, 7 in 1984. Later on, the rate could be increased to 8 or even 10 if necessary. Such a method, while not easily adaptable to demand variations, has however the advantage of making the best possible use of the plants and equipment, which makes operation more economical and avoids sudden hirings and firings which are very unpopular this side of the Atlantic.

Let us now consider what happened in July. After proclaiming everywhere that the B 767 was better than the A 310 in every respect, Boeing had intended to strike a decisive blow by having the seventh B 767 cross the North Atlantic

with a few journalists on board, as part of the endurance flight program on airways required prior to certification. Of course, as we said above, such a crossing would not be permitted as a commercial flight: as an experiment, it was.

On 6 July at 20:15, the seventh B 767, already carrying United Airlines' colors, left the Boston airport (northeast of New York); 81 passengers were on board and the tanks were full, i.e. the aircraft was carrying 51.6 tons of fuel. Considering the freight in its hold, the B 767 was even overloaded since it weighed 147.85 tons, i.e. close to 12 tons over the weight at which it was scheduled to be certified (136 tons). There again, such an overload would not be permitted on a regular flight: we should point out, however, that by 1983, with somewhat higher-thrust engines, the B 767 will see its maximum takeoff weight increased to 143 tons, and to 152 tons by 1984. Therefore, as a demonstration, the decision to have the aircraft take off with a weight of 147.85 tons was not unusual... but the takeoff took a long time.

Eight hours and 11 minutes later, i.e. in the morning of 7 July, the aircraft landed in Turin; as the crow flies, it had covered close to 6,000 km, with a slight tail wind it must be said; but, prior to that, the aircraft had flown over the London area before finally heading for Turin: therefore, the "flight" distance to consider was, according to Boeing, close to 7,000 km. On landing, there were still 11.4 tons of fuel in the tanks; the aircraft had consumed 40.2 tons of kerosene, i.e. 5.74 kg/km "flown." The "equivalent" payload (81 passengers plus freight plus excess fuel) was somewhat over 20 tons. Therefore, the B 767 could easily have carried 200 passengers and their luggage on that same flight, and even gone appreciably further.

On the European side, in the afternoon of 3 July, i.e. 3 days earlier, the second A 310, which had flown only 23 times since its initial flight, was at the Kuwait airport. The heat was stifling: 42°C in the shade, which lowered both the engine thrust and the wing lift (the air being less dense). At the controls was Bernard Ziegler, Airbus Industrie test flight manager, who had secretly prepared a "very long" flight, much longer than that announced by Boeing. The aircraft had of course full fuel tanks (43 tons of fuel) and took over at its maximum "normal" weight of 138.6 tons; the sizeable testing equipment was still on board and, together with various equipment and spare parts, represented a load of 18.6 tons (i.e. very precisely 200 passengers at 90 kg each, luggage included).

At 3:30 am (4 July) after an 8 hour 40 minute flight, the second A 310 landed in Singapore; it had covered 6,780 km but, in view of the strong head wind which had prevailed (over 80 km/h), the equivalent "flown" distance was 7,410 km. On approaching, the aircraft still had 4.2 tons of fuel in its tanks, enough to fly another 70 minutes and be diverted to Jakarta. Total consumption was 38.9 tons, i.e. 5.25 kg/km. Even taking into account the difference in weight between the two aircraft (the B 767 being 6.7 percent heavier), the new Airbus had shown that its specific fuel consumption was slightly lower than that of the B 767, not 10 percent higher as Boeing liked to "demonstrate" based on a graph.

Presumably piqued by the feat of the A 310, the B 767 team did not wait long to react; following its tour of Europe and the Middle East, the seventh B 767, leaving Oslo on 21 July, was scheduled to fly to Seattle via Frobisher (Baffin Island): but that is not what it did. Ignoring the scheduled stop, it flew nonstop from Oslo to Seattle, thus covering 8,030 km in 9 hours 50 minutes, after taking off with a weight of 143.8 tons, including a 13.8-ton payload. For a "medium-haul" twin jet, this is certainly a remarkable performance. But, there again, the fuel consumption was 5.7 kg/km, higher than that of the A 310.

Spectacular as these long-range flights may be, they should not make us forget that present regulations, especially U.S. regulations (which are more severe than the international ICAO [International Civil Aviation Organization] regulations), will hardly allow either the A 310 or the B 767 to be used for everyday commercial flights across the North Atlantic. But some pressure is already being exerted on the Federal Aviation Agency to induce it to amend its regulations. In the medium range, therefore, these two aircraft could be used to connect European capitals and the large cities on the east coast of North America, although passengers' attitudes could act as a psychological brake: they should not be blamed if they prefer crossing the Atlantic on board a three-jet or four-jet aircraft, even though the 90-minute rule guarantees them "reasonable" safety should one of the engines fail...

The airlines too will probably hesitate. But what will happen when one or two airlines, attracted by the high efficiency of the two new aircraft, decide to use them on North Atlantic airways? Sooner or later, the others will have to follow suit if they are not to lose some of their customers. The example of Laker is there to show that low-cost tickets are terribly attractive. And it is easier to fill a 200-250 seater than a B 747 (400 to 500 seats).

In the short range, however, the competition between Boeing and Airbus Industrie will be restricted to short and medium-haul networks. In principle, Boeing has the advantage with 173 firm orders plus 118 options for its B 767--i.e. a total of 291 units--from 17 companies. But Boeing has not sold a single B 767 during the past year,\* and 221 of these aircraft (i.e. 76 percent) were sold on the privileged market represented by North America, not to mention the Damocles sword represented by requests from several North American companies, most of them operating in the red, to cancel orders or postpone deliveries, and banks' strong hesitations in granting all the credits required to purchase new aircraft, even more efficient ones.

The position of Airbus Industrie appears much better. Only 192 A 310's have been sold, but also to 17 companies better distributed geographically. In addition, the A 300 is still being sold (323 units, including 185 already delivered). The total number of aircraft to be delivered (330) is therefore higher than for the Boeing. And, with 103 orders in 24 months, compared with 21 order for the Boeing, the European consortium is sailing with the wind; it has even managed to outclass Boeing 98 percent on the Middle East and Far East market, the most active at present.

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\* At least early in August, when this article was written.

The excellent reputation of the A 300 has done a lot to facilitate the introduction of the A 310, the performances of which appear to be slightly better than those of the B 767 on short and medium flights. On truly long flights, the two aircraft can be expected to be even: but, as we have seen, the market is not yet ready for this type of operation. Except in one area: the Middle East where flights over the sea are the shortest; and it is precisely in this area that the A 300 and A 310 have scored the most points.

Of course, with 200 customers instead of 46, its remarkable power of adaptation and its very complete line--B 747, B 757 and B 767 twin jets, B 727 three-jet and B 747 four-jet aircraft--Boeing still has pride of place. But, confronted with a market in full recession, its production rates are declining dramatically. It will take many years to repay the huge investments required by the almost simultaneous introduction of the B 757 and B 767, i.e. over 3 billion dollars (close to 19 billion francs!). The same is true, of course, of Airbus Industrie: but, in such a situation, it is better to be supported by governments who care about employment than by a banking apparatus, however powerful, which is more concerned about short and medium-range profitability.

Technically, both manufacturers--it is now obvious--are equal; they use the same technologies and the same engines (Pratt and Whitney and General Electric); as far as financing conditions are concerned (length and interest rates on 8-10 year loans to purchasers), competition remains severe but appears to be even; geopolitically, some market areas are still halfway off-limits, but they have become smaller: the United States for Boeing, Europe for Airbus Industrie (and yet...).

There remains the "line effect"; far ahead of Douglas (DC 9 and DC 10), Boeing remains the only manufacturer with a complete line of transport aircraft, which is an undeniable advantage when dealing with airlines, especially small and medium-size ones. The Seattle manufacturer is understandably worried (which explains its calls for help from the U.S. government) by the almost certain introduction of a 150-seat twin-jet, the A 320, by Airbus Industrie. The European consortium has already obtained the agreement in principle of its 6 present partners and has just obtained Canada's (De Havilland Aircraft) for up to 500 million dollars, in exchange for a 10 percent guaranteed participation in the A 320 design and manufacturing program. When the latter is actually started, i.e. in the coming months, the war between Boeing and Airbus Industrie will extend to a much larger front. At the very moment when M.T.A. Wilson, chairman of Boeing, does not hesitate to state: "If I had known that the market would become what it has become, we would never have taken the risk of introducing two programs as large as the B 767 and the B 757 at a few months' interval." Faced with the A 320, will he be in a position to introduce the B 777?

9299

CSO: 3102/448



## TRANSPORTATION

### MAGNET-DRIVEN TRAINS DEVELOPED FOR BERLIN

#### Test Runs in 1984

Duesseldorf VDI NACHRICHTEN in German 9 Jul 82 p 1

[Article by R.R.R.: "The Magnetic Train Will Roll in Berlin in 1984"]

[Text] The first "M-train" is scheduled to make its first test run in Berlin's Kreuzberg district in 1984. The FRG Ministry for Research and Technology has agreed to pay for 75 percent of the overall cost. They will amount to DM 50 million in two parts: the first includes retrofitting of a section of subway tracks no longer in use to accept the new system; the second part will include tests for roadworthiness, structural effects and acceptance by the public.

Even though the advantages of compartmentalized trains consist mainly in connecting peripheral parts of the city with existing traffic hubs, optimists can already visualize M-trains rolling on currently inactive S-train lines and even on the existing U-train lines. They maintain that all that is necessary would be to superimpose the special M-train rail on the existing rails and to move the line motor. Thus reactor to the project ranges all the way from euphoric visions of the future to contemptuous rejection. The CDU Senat and fraction maintain that Berlin could continue its great tradition and functions in the transport sector. The M-train, they say, could be exported from here to the rest of the world. The SPD on the other hand, during whose reign the project was actually initiated, took a more distant view: the Senat, they say, should first propose a financially feasible concept for the obsolete S-train. In addition, the SPD spokesman drew a parallel between the "M" and Maerklin, the model railroad manufacturer, thus clearly expressing his fraction's attitude toward the magnet-driven train project.

## Unconventional Technology

Duesseldorf VDI NACHRICHTEN in German 9 Jul 82 p 26

[Article by R.R.R.: "The M-Train Has Already Logged 200,000 Km of Test Runs"]

[Text] The M-train, which is to run on a 600 meter stretch in West Berlin's Kreuzberg district in 1984, is one of the compartmentalized trains with automated controls, just like the H-train in Dortmund which has also been fabricated for the first time for public use. Advantages are seen in comparison with buses or conventional rail vehicles especially because of the reduced need for operating personnel because of its driverless operation, the more flexible computerized guidance system, as well as economy in the use of energy.

M-train cars are guided and supported on their track by rollers, with repelling permanent magnets providing a considerable reduction in the weight affecting the carrying rollers. In the roadbed there is the triple-phase winding of a fixed linear motor, whose broad frequency field moves the train. They can therefore be manufactured simply, easily and relatively cheaply. The roadbed investment too is said to be only half as expensive as that of U- and S-trains.

However, just the retrofitting of the existing U-train system, unused since the 1961 partition, extending from the Gleisdreieck rail station in the direction of Potsdamer Platz, is estimated at DM 20 million, even though the M-train will travel only as far as the Schoeneberg shore, a distance of 600 meters. For the time being, the intention is to test the new technology there, which has already logged 200,000 km in test runs at a test facility of the TU Braunschweig. Upon official certification, the train will be turned over for public use. This will require further costs, budgeted at DM 30 million, for structural compatibility, roadworthiness and public acceptance. A later phase would propose extending the line to Kemperplatz.

AEG-Telefunken has participated to a considerable degree in the M-train system project since 1978. The firm wants to build components and cars in Berlin and thus hopes to create 300 new jobs.

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## TRANSPORTATION

### DFVLR DESIGNS AIRCRAFT TO DEVELOP, TEST NEW TECHNOLOGIES

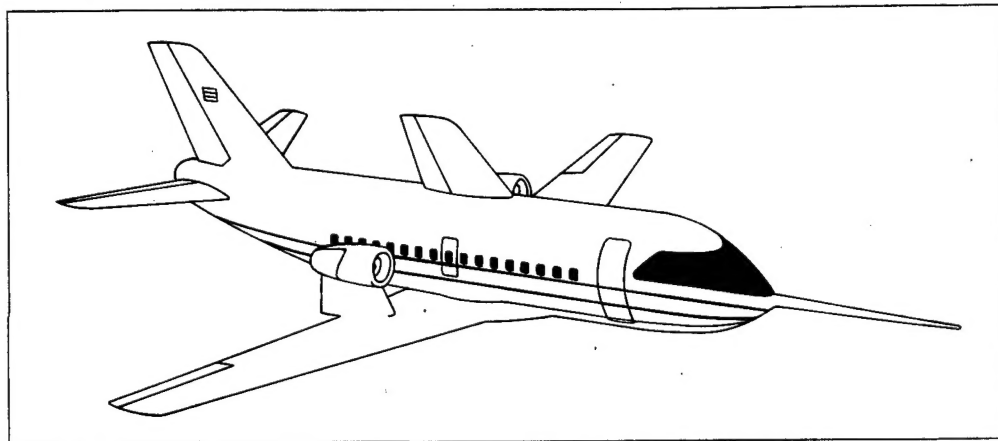
Cologne DFVLR NACHRICHTEN in German Jun 82 p 38

[Article: "New DFVLR Research Aircraft Under Development"]

[Text] Even the most modern transport aircraft can still reduce their fuel consumption, for instance through optimum flight procedures in direct landing without going around which, together with extensive stacking in the immediate airport vicinity can account for up to 25 percent of the total fuel consumption. The DFVLR [German Research and Development Institute for Air and Space Travel] in Braunschweig will therefore intensify its research programs for development and testing of new flight procedure technologies. An important prerequisite therefore is the retrofitting of a research aircraft which will be used as a "flying simulator." Bremen's Vereinigte Flugtechnische Werke [United Aviation Technologies] are therefore re-equipping a VFW 614 aircraft (illustration) for research purposes. This flying laboratory is intended for development and testing of new flight procedure technologies. The emphasis in this will be new navigation methods, the use of microelectronics, improved information and graphic presentation systems for pilot use, as well as improved communication with ground controllers and other aircraft.

Currently the most acute problems in air traffic are high traffic density, environmental disturbance by noise and air pollution, and steadily increasing costs of personnel and raw materials. Research with the use of the new flying laboratory is intended to provide solutions to some of these problems by developing means for reducing minimum distances between aircraft and closer landing sequences as well as to establish flight patterns which would save on fuel and reduce noise pollution to the lowest possible level. The flying laboratory will be used mainly within the immediate airport area, in final approaches as well as in takeoffs and landings. Such use will be pertinent to investigation of flight characteristics of civilian transport aircraft, whereby the flying laboratory will be used as an in-flight simulator. In addition, the research aircraft will be used for testing digitally integrated flight guidance systems (e.g., Autoland) as well as for automated air traffic control and new landing systems. One of the prerequisites for employing the DFVLR research aircraft in these tasks is the capability of flying the aircraft "electrically. Only the backup pilot would use the normal mechanical control

system in special cases; the test pilot however gives his commands by way of an on-board computer to an automated control system. This makes it possible to combine the pilot's commands with the pre-programmed test program in the computer. In this way it is possible to change the overall aerodynamics of the aircraft in such a way that it can assume the characteristics of, say, an Airbus. Inasmuch as the flying laboratory can in addition be equipped with an interchangeable instrument panel at the test pilot's seat, pilots can test the airworthiness of new aircraft and their electronics long before the first prototype is rolled out. The aircraft being retrofitted by VFW is to be ready by late 1984. Thereafter, the DFVLR will equip it with its data processing system and the test program will follow. It is estimated that the flying test laboratory will be available for customer contracting in late 1986.



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DFVLR-N

The new DFVLR research aircraft; other possibilities include an additional stabilizer fin, as shown in the sketch.

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## TRANSPORTATION

### FUTURE OF ROLLS-ROYCE RJ500 STILL NOT CLEAR

Paris AVIATION MAGAZINE INTERNATIONAL in French 1 Sep 82 pp 34-35

[Article: "Rolls-Royce: Rationalization First"]

[Excerpt] That Famous "10-Tons"

The British engine manufacturer is now concentrating its efforts on improving projects with a large technological and commercial potential, on the one hand, and on the study of entirely new realizations, on the other hand. The new 524 and 535E4 versions of the RB-211, the Pegasus F402-RR-406 intended for the AV-8B Harrier II,\* the Spey 807 to propel the Italian-Brazilian AMX support aircraft, or again the thrust increase on the Adour and Viper, the improvement of the specific consumption of the famous Dart, the development of the Gem, etc., obviously fall into the first category.

The principal new projects are essentially the RJ500, an English-Japanese 10-ton civilian aircraft, the RB 401 in the 2,500 kgp class, intended both for the corporate aircraft and the light military aircraft markets, and, finally, the RB510, a new generation 2,500-3,500 hp turboprop which, in the long range, could see its power increased to, or beyond 5,000 hp.

To a large extent, the RJ500 gets star billing; two demonstration engines are operating on the bench, one in Derby, the other in Tokyo. Obviously, the 10-ton and 150-seat aircraft will still be much talked about: aircraft and engine manufacturers everywhere agree more strongly than ever that there is a large potential market for these aircraft, that it is just a matter of waiting long enough, that the recession justifies postponing a real start to the end of the decade.

The RJ500, which is in the 9,000-12,250 kgp range, pending precise requirements from aircraft manufacturers, associates the Derby manufacturer with a Japanese consortium consisting of Ishikawajima-Harima, Kawasaki and Mitsubishi. The

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\* Engine names on both sides of the Atlantic are often a headache and a source of confusion. Rolls-Royce habits in this respect are no exception to the rule...

industrial implementation of such a project will require colossal investments (probably at least 750 million pounds) and explains why fierce competitors no longer hesitate to find an area of agreement.

A few months ago, Rolls-Royce and Pratt & Whitney agreed on the advantage of a tentative agreement. Negotiations are now in progress, very discreetly, in the hope of allying the RJ500 and the STF-632, with MTU [expansion unknown] and Fiat following not far behind. A total of seven engine manufacturers, therefore, including two of the three world giants, since General Electric will stick to its French connection, i.e. its agreements with SNECMA [National Aircraft Engine Study and Manufacturing Company]. There again, they will meet in Farnborough to see if negotiations have serious chances of succeeding. And to see what is in store for the Airbus A-320, McDonnell-Douglas D-3300 and other Boeing 7-7 projects.

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## TRANSPORTATION

### BRIEFS

ATR42 ORDERS--Air Caledonie, headquartered in Noumea, just ordered two French-Italian ATR42 commuter aircraft, thus bringing to 34 the total number of orders for this aircraft. In a communique, the National Industrial Aerospace Company (Aerospatiale), which formed an economic interest group with Aeritalia in order to develop this new aircraft, indicated that Air Caledonie had also taken an option for two more aircraft. The ATR42, scheduled to be delivered in May and October 1986, will be used on the domestic and regional Pacific networks of Air Caledonie. The airline chose the ATR-200 46-48 passenger version; it is the seventh airline in the world and the first in Oceania to select the ATR42. According to Aerospatiale, world airline requirements for commuter aircraft will amount to 2,000 units over the next 15 years. [Text] [Paris LES ECHOS in French 3 Sep 82 p 8] 9294

CSO: 3102/457

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